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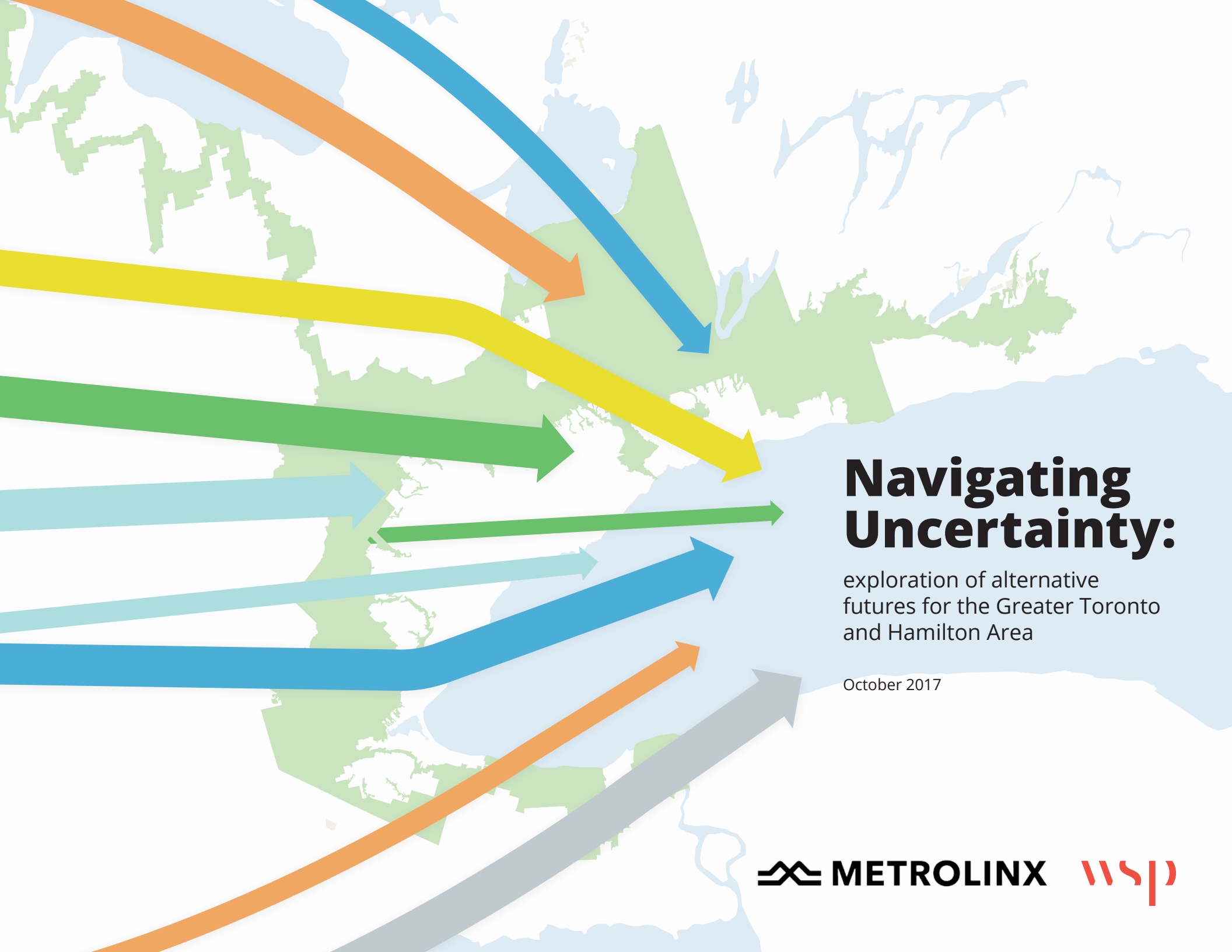
NAVIGATING UNCERTAINTY

Background Paper to the
Draft 2041 Regional Transportation Plan

Prepared for Metrolinx
by WSP
2017



Navigating Uncertainty:

exploration of alternative futures for the Greater Toronto and Hamilton Area

October 2017

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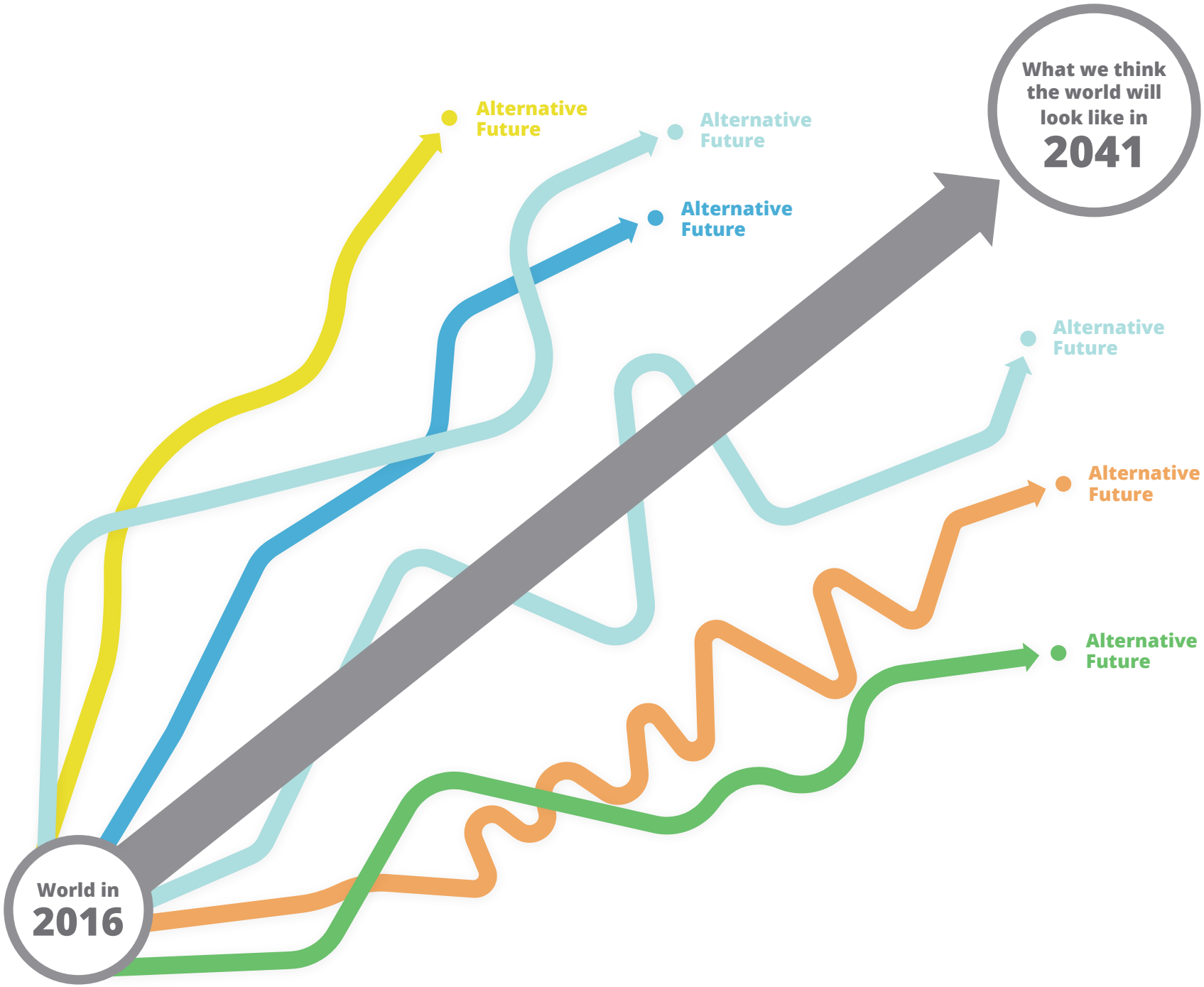

What we think the world will look like in 2041
Alternative Future
Alternative Future
Alternative Future
Alternative Future
Alternative Future
Alternative Future
World in 2016

Navigating Uncertainty Through Scenario Planning

Why Scenario Planning?

What will the world look like tomorrow? In a year? 10 years? How about 25 years? Imagining the future is often a challenge, and the further out we look, the fuzzier it becomes. So how are we to plan for the future when we do not know what this future looks like? This is where scenario planning becomes extremely useful. Scenario planning helps to shift the conversation from what we think **will** happen to what **could** happen. It ensures that strategies and solutions put forward for the future are effective not only under the most predictable circumstances, but also in case of the unexpected. With new technologies on the horizon, the emergence of the digital economy, climate change looming and growing risk of global instability, the world is more uncertain than ever.

When Metrolinx first released The Big Move in 2008, smart phones had only just begun their steep ascent to becoming a common everyday item, ridesourcing services had yet to enter the Canadian market, and the real estate landscape in the Greater Toronto and Hamilton Area was quite different than today. In less than 10 years we have seen substantial change, and the years to come will undoubtedly bring accelerated change.

The Next Regional Transportation Plan (RTP) establishes a vision for the Greater Toronto and Hamilton Area (GTHA) for the year 2041 and sets out strategies that include transportation and transit capital projects, policies and programs. Much can happen over the next 25 years and the plan will have to respond and be resilient to many of the changes that occur. To help us think about the range of possible futures that may come our way, Metrolinx has undertaken a scenario planning exercise, led by WSP, to test the resiliency of the strategies proposed for the next 25 years. The following pages will guide you through the scenarios and provide a sense of how the world might change, what this change will mean for life in the region and what are some of the things we can do as a region to mitigate impacts to ensure our region continues to flourish for years to come.

Scenario Development

Scenario planning is a common practice in the business world, but less so in regional planning. To inform the development of the scenarios, we studied how scenario planning exercises have been undertaken by select regional planning agencies in comparable jurisdictions. What we found was that there are a number of different ways to approach scenario planning, but the trend has been towards the alternative futures approach. Whereas past scenario planning applications have focused on considering the impacts of controlled degrees of change in factors such as population and job growth and distribution, more recent applications using the alternative futures approach consider the impact of wide-ranging mega trends in order to understand how the world might change in unexpected ways. Our research suggested that other agencies have benefited from taking this broader approach and have adjusted their plans as a result, taking future uncertainty into account.

Alternative futures bring together trends from a broad range of areas in order to paint a picture of what the future might look like. Trends can change in a number of different ways over time, and the interactions between different drivers of change can also trigger the emergence of other trends. To assist us in defining the trends that we should be most aware of, we sought the input of a Thought Leader Panel, which consisted of experts from a range of disciplines, including government and non-government organizations, the private sector, and academia. Differing opinions from the panel regarding the emergence and impact of specific trends reinforced that there is a high degree of uncertainty regarding the future of the region and the role of mobility. However, our panelists also found common ground in some areas. It was generally agreed that many trends would have dichotomous effects, impacting suburban communities differently than dense urban areas. There was also consensus that the future is unlikely to manifest as any specific one of the alternative futures proposed, but rather contain elements of each of the scenarios in combination. Together, these perspectives helped us to create and refine six alternative futures for the region.

Alternative Futures

We created a total of six alternative future scenarios that have been grounded in research on major trends and validated by a panel of experts from a broad range of disciplines. Each scenario pivots off of a core idea or question and illustrates an alternative future that is shaped by an array of driving forces that stem from different topic areas, including demographics, the economy, technology and the environment. The alternative future scenarios are as follows:

1

Rapid Adoption of Emerging Technologies

A future driven by rapid adoption of new technologies

2

Rapid Growth of Core Areas

A future focused around new centres fueled by diversity and creative culture

3

Extreme Climate Change

A future where climate change arrives early

4

On-Demand Economy

A future where on-demand culture permeates the job market

5

User Pay Economy

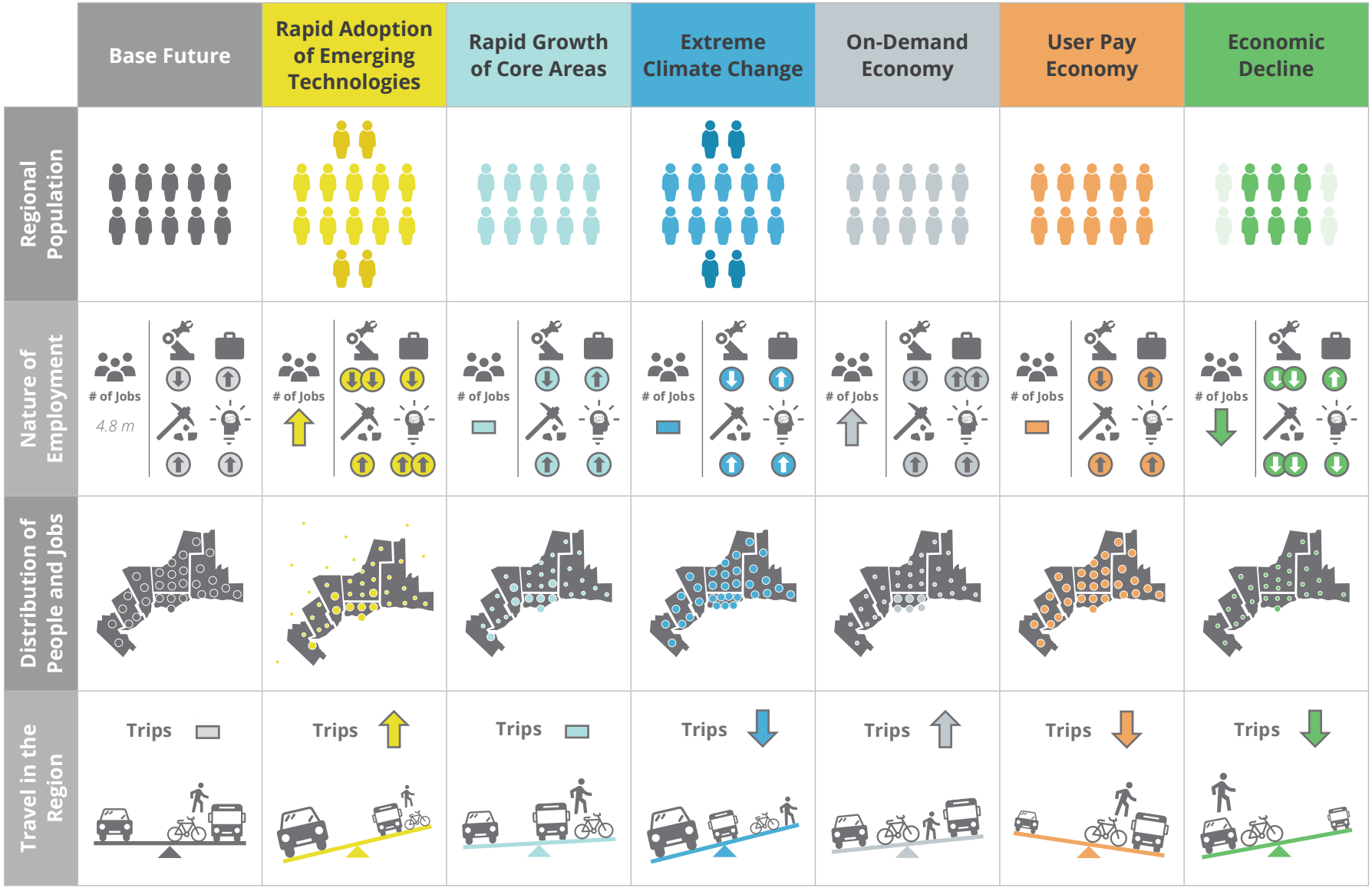
A future where consumers pay the full cost of their resource consumption

6

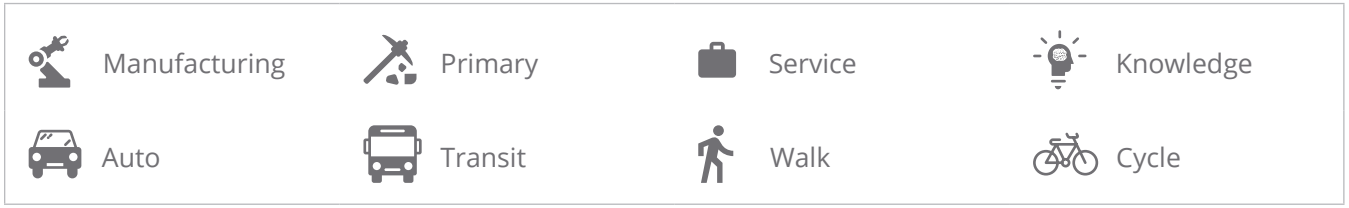
Economic Decline

A future where the region is eclipsed and no longer a prime location for immigration

Broad global and regional trends can manifest in major changes that have direct implications at a local scale. The table on the following page highlights some of the potential impacts that each scenario might have on the region. The baseline future represents the state of the Greater Toronto and Hamilton Area (GTHA) region in 2041, assuming that there are no significant departures from current trends. The population and employment projections are consistent with the regional and subregional totals contained in the Ontario Growth Secretariat's Growth Plan for the Greater Golden Horseshoe, 2017. Scenario development allows Metrolinx to consider alternative futures where emerging trends are magnified and the population and employment may depart from the Growth Plan projections. In the table on the following page, the scenarios are described in relation to this baseline future.


Base Future
Rapid Adoption of Emerging Technologies
Rapid Growth of Core Areas
Extreme Climate Change
On-Demand Economy
User Pay Economy
Economic Decline
Regional Population
Nature of Employment
# of Jobs
4.8 m
Distribution of People and Jobs
Travel in the Region
Trips

Legend


Manufacturing
Primary
Service
Knowledge
Auto
Transit
Walk
Cycle

Meet the Personas

In thinking through alternative future scenarios, we considered “personas” that represent people living in the region today. We created stories for each persona to help highlight what transportation means for different people and imagine how the world might look from their points of view under each of the scenarios in 2041. This allowed us to focus planning on what matters most to people living in this region.

The personas were developed to illustrate the regional diversity of the GTHA, how it is made up of people from a wide range of backgrounds and various walks of life with an assortment of interests and lifestyles. Despite our differences, we are all reliant on the transportation system to help us carry out our daily activities, whether it be to get us to school or work on time, take us to the store to pick up groceries, let us meet up with our friends or to bring us home at the end of the day. It is important that we understand what matters most to those living in the region when considering how we can improve our transportation system. That is why the six regional personas were developed through research and analysis by Northstar on behalf of Metrolinx. Each persona represents a type of traveller in the region and is defined by a number of characteristics, including age, income, lifestyle and perceptions on various aspects of the transportation system. While not everyone in the region will be able to fit perfectly into these persona profiles, they help us to draw out the themes of how people feel about travel in the region, what choices they make and why they travel the way they do. The personas help to reveal a wide range of travel needs in the region and ensure that Metrolinx is able to appropriately serve the needs of different people through the 2041 RTP.

THE TIME & BALANCE SEEKER

Raymond

Age: Early-40s
Live: Suburbs | **Work:** Toronto
Travel: Prefers the car, but will take transit, carshare, and ridehailing services on occasion.
Technology: ♥ ♥ ♥

Hard-working and family-oriented. Values safety, cleanliness, value, and speed. Likely to keep driving, but open to taking transit.

THE ASPIRING YOUNG TRAVELLER

Camille

Age: Early-20s
Live: Toronto | **Work:** Toronto
Travel: Uses a variety of modes, including transit, cycling and walking.
Technology: ♥ ♥ ♥

Young and active, but with lower income. Values affordability, safety, and reliability in travel. Open to trying new things.

THE SATISFIED MATURE URBANITE

Barbara

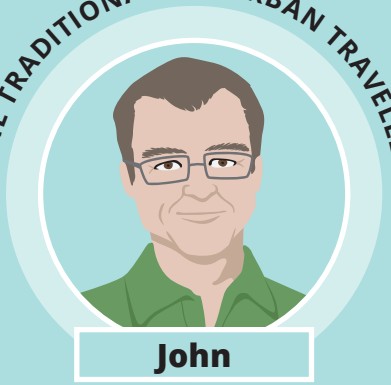
Age: Late-50s
Live: Toronto | **Work:** Toronto
Travel: Prefers to walk or take transit for most trips.
Technology: ♥

Intellectual and environmentally conscious. Values punctuality, safety, and affordability. Unlikely to cycle or use ridehailing services.

Age: Late-40s
Live: Suburbs | **Work:** Suburbs
Travel: Heavily reliant on the car. Might consider taking GO, but only for fun and entertainment.
Technology: ♥

Car-lover and homebody. Values convenience, speed, and control. Willing to drive long distances (up to 50 km one way)

THE TRADITIONAL SUBURBAN TRAVELLER



John

THE CONNECTED OPTIMIZING URBANITIE

Dev

Age: Mid-30s
Live: Toronto | **Work:** Toronto
Travel: Typically drives, using either a personal vehicle or carshare. Will occasionally take GO or use a ridehailing service.
Technology: ♥ ♥ ♥

Educated, spontaneous, and ambitious. Usually drives or takes transit, but not a fan of either. Likes exercise but not while commuting. Likely to keep driving, but open to taking transit.

THE FRUSTRATED SOLUTION SEEKER

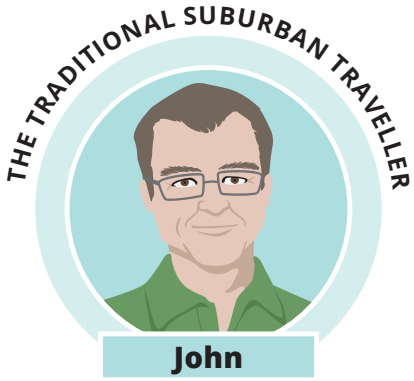
Susan

Age: Late-40s
Live: Suburbs | **Work:** Suburbs
Travel: Drives all the time, but open to taking GO, provided that they have an easy way to get to the station.
Technology: ♥ ♥

Highly-educated and affluent. Values punctuality, convenience, safety, and personal space. Finds travelling the region frustrating, and sometimes works from home.

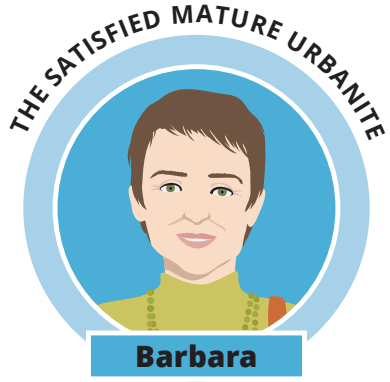
I'm in my late-40s, living in the suburbs with my husband – the kids are away at school. I work in Toronto and am very well educated. I make a good living and consider myself an intellectual, as I'm always reading and learning more about interesting topics. I also enjoy being at home cuddled up on the couch watching a show or a movie with our two cats. I believe in following the rules and I'm not comfortable taking risks. I'm not that into technology, in fact, I'm less likely than the others to be interested in it. It's important to me that people respect my time and my personal space. I work from home once in a while. I am most likely to spend a lot of time online reading newspapers, magazines, and various websites that interest me.

See what I have to say about the ***'Rapid Adoption of Emerging Technologies'*** alternative future scenario on ***page 16.***



I'm in my mid-50s, married, and enjoy being an empty nester. I live and work in the suburbs and often work from home. I love to relax at home, watch sports, or go for walks with my dog. I'm the least interested in technology and least likely to spend time online, especially when it comes to social media and streaming content. I do, however, read online newspapers, magazines, and certain websites. I really value punctuality and cleanliness and enjoy being on my own and having my own space, and I don't like taking risks.

See what I have to say about the ***'Rapid Growth of Core Areas'*** alternative future scenario on ***page 22.***



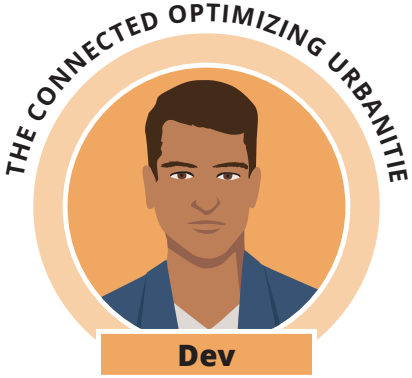
I'm the oldest of the personas, in my late-50s, living in Downtown Toronto with my husband. Our kids have families of their own now but having Buster, our dog, around means there's still lots of activity in the house. I'm one of the most educated (most likely to have a post grad degree) and consider myself an intellectual. I have been retired for a few years now so I have to think about our budget whenever we take a trip in the region. I'm less interested in technology than the other personas and, along with 'The Traditional Suburban Traveller', I'm least likely to be on social media or stream content online but I spend some time online reading newspapers, magazines, and visiting various websites. Punctuality and the environment are important to me. I love my neighbours and neighbourhood, and am optimistic about where the City is headed.

See what I have to say about the ***'Extreme Climate Change'*** alternative future scenario on ***page 28.***

I'm the youngest of the personas, in my early-20s and I've just started my new job in Downtown Toronto. I have the lowest income and I currently am living with roommates (Toronto is expensive!). Because I'm new at my company, it's extra important that I'm on time – I need to feel confident that my mode of transportation is reliable and predictable. I love watching all kinds of shows and movies on Netflix. I'm into technology, art, music, food, and fashion – whatever is going on in the City. I work hard (I've got big plans for the future) and I love to try new things, so I'm really busy. I'm very connected, online and offline, and have a considerable social media presence.

See what I have to say about the ***'On-Demand Economy'*** alternative future scenario on ***page 34.***

I'm in my mid-30s and one of the youngest personas. My partner and I just had our first child, and we are looking to move out of our Liberty Village condo into a house (the city is expensive, and we may have to consider moving to the suburbs). I'm the most likely to be employed full time and I work in Toronto. I'm athletic, enjoy sports, and always try to look my best. I'm well educated and ambitious – I work hard and play hard (although a bit less since my son was born). While I'm spontaneous, I'm always concerned about being safe in the city and sometimes I feel claustrophobic with so many people around all the time. I'm really into technology and my friends usually come to me for advice on this topic. The environment isn't particularly important to me. I travel around the region the most of all the personas, for many different reasons.



See what I have to say about the ***'User Pay Economy'*** alternative future scenario on ***page 40.***

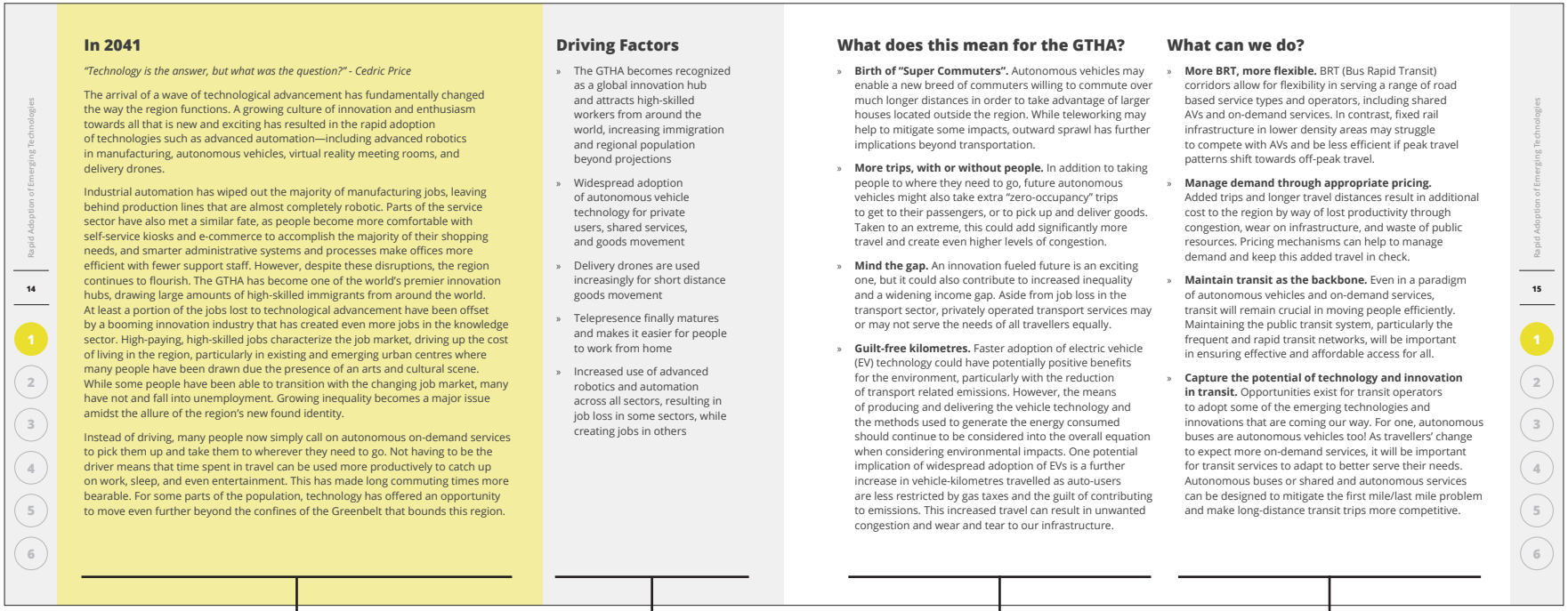
In my early-40s, I live in the suburbs not far from Toronto with my spouse and two wonderful kids. We love our neighborhood because it provides a nice balance between being close to everything and the family-friendly atmosphere of the suburbs. I am concerned about crime and cleanliness so the suburbs are perfect for us. I commute into Toronto for work. I'd say I'm ambitious, but having a good work-life balance is really important to me. I like trying new things, especially with the family, and I'm pretty interested in technology. I enjoy using social media and am most likely to use Facebook (posting photos of my kids of course!) and streaming radio. Like many others, I enjoy watching videos on YouTube, streaming my favourite shows on Netflix, and reading news online. Working full time and having kids with activities means my days are pretty busy, but I always make sure I make time for family.

See what I have to say about the ***'Economic Decline'*** alternative future scenario on ***page 46.***

Exploring the Scenarios

Navigating the Scenarios

The following chapters highlight the different alternative future scenarios developed for the GTHA. Each chapter begins with an overview of the scenario and the driving factors that have resulted in this alternative future. Implications for each of the scenarios is then highlighted, along with potential recommendations for what can be done to mitigate the impacts.



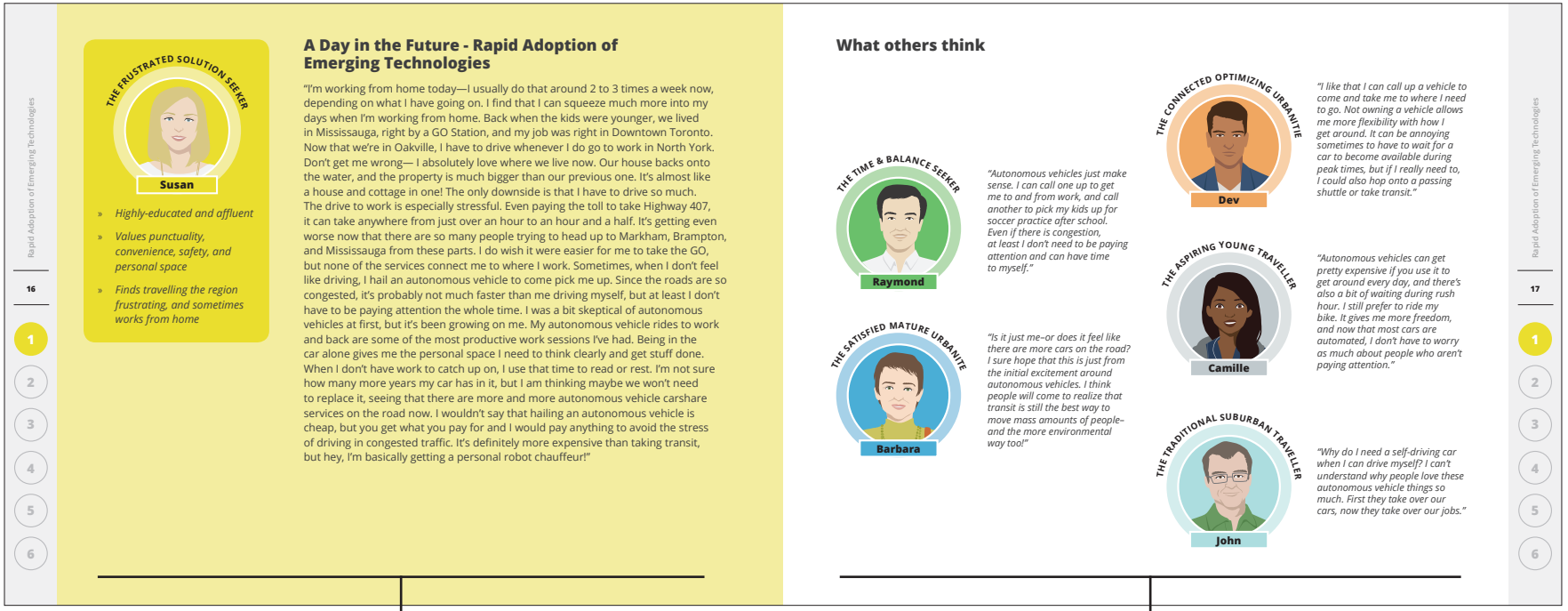
Alternative future scenario in 2041

Major driving factors that have shaped the alternative future scenario

Major implications of the alternative future scenario

Potential strategies and actions that could be taken to mitigate impacts

We then follow the personas into the future to see what life looks like in 2041 under each alternative future. For each alternative future scenario, one persona will take us through their day and talk about their experience travelling through the region. This is then followed by short comments from the other personas, who give their own two cents about their circumstances given the scenario at hand.



A walkthrough of one persona's day living in 2041 under the alternative future scenario

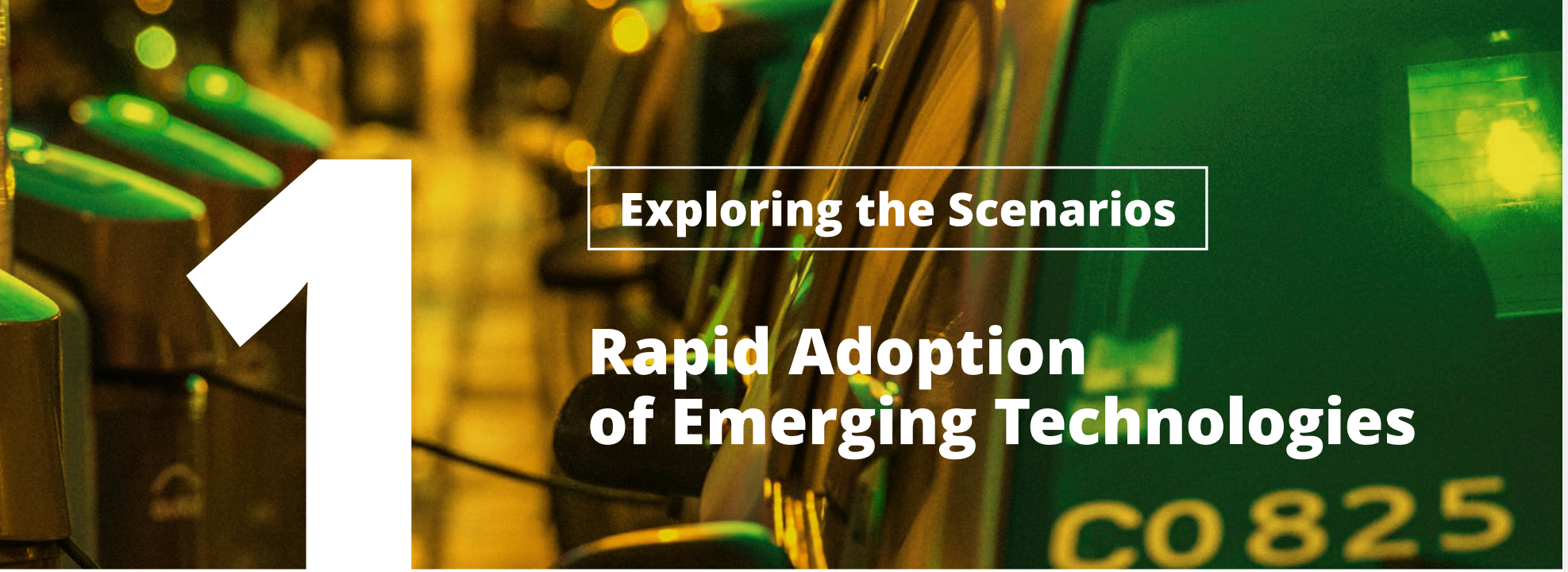
Thoughts from the other personas on what this alternative future scenario means for them

Despite continued productivity gains, manufacturing employment in the region has been in steady decline since 2004.[1]

When will autonomous vehicles arrive? Automakers and technology developers believe that autonomous vehicles will be road ready by 2018 to 2020. How quickly consumers adopt them is still to be seen.[2]

Most researchers agree that widespread adoption of autonomous vehicles will likely result in increased vehicle-kilometres travelled (VKT) and possibly more congestion.[3 4 5]

1 Hemson Consulting Ltd and IBI Group (2016)
2 Lauren Isaac (2016)
3 Long T. Truong, Christ D Gruyter, Graham Currie, Alexa Delbosc (2017)
4 Bradley Kloostra (2017)
5 Peter Davidson and Anabelle Spinoulas (2015)



Exploring the Scenarios

1 Rapid Adoption of Emerging Technologies

New technologies have vastly altered the way of life in the region. The nature of employment has changed, with the loss of some jobs and the emergence of others. Autonomous vehicles proliferate throughout the region and beyond, transporting passengers and goods, and, at times, travel empty in order to make a pick up.

iStock.com/anouchka

In 2041

"Technology is the answer, but what was the question?" - Cedric Price

The arrival of a wave of technological advancement has fundamentally changed the way the region functions. A growing culture of innovation and enthusiasm towards all that is new and exciting has resulted in the rapid adoption of technologies such as advanced automation—including advanced robotics in manufacturing, autonomous vehicles, virtual reality meeting rooms, and delivery drones.

Industrial automation has wiped out the majority of manufacturing jobs, leaving behind production lines that are almost completely robotic. Parts of the service sector have also met a similar fate, as people become more comfortable with self-service kiosks and e-commerce to accomplish the majority of their shopping needs, and smarter administrative systems and processes make offices more efficient with fewer support staff. However, despite these disruptions, the region continues to flourish. The GTHA has become one of the world's premier innovation hubs, drawing large amounts of high-skilled immigrants from around the world. At least a portion of the jobs lost to technological advancement have been offset by a booming innovation industry that has created even more jobs in the knowledge sector. High-paying, high-skilled jobs characterize the job market, driving up the cost of living in the region, particularly in existing and emerging urban centres where many people have been drawn due the presence of an arts and cultural scene. While some people have been able to transition with the changing job market, many have not and fall into unemployment. Growing inequality becomes a major issue amidst the allure of the region's new found identity.

Instead of driving, many people now simply call on autonomous on-demand services to pick them up and take them to wherever they need to go. Not having to be the driver means that time spent in travel can be used more productively to catch up on work, sleep, and even entertainment. This has made long commuting times more bearable. For some parts of the population, technology has offered an opportunity to move even further beyond the confines of the Greenbelt that bounds this region.

Driving Factors

- The GTHA becomes recognized as a global innovation hub and attracts high-skilled workers from around the world, increasing immigration and regional population beyond projections
- Widespread adoption of autonomous vehicle technology for private users, shared services, and goods movement
- Delivery drones are used increasingly for short distance goods movement
- Telepresence finally matures and makes it easier for people to work from home
- Increased use of advanced robotics and automation across all sectors, resulting in job loss in some sectors, while creating jobs in others

What does this mean for the GTHA?

» **Birth of "Super Commuters".** Autonomous vehicles may enable a new breed of commuters willing to commute over much longer distances in order to take advantage of larger houses located outside the region. While teleworking may help to mitigate some impacts, outward sprawl has further implications beyond transportation.

» **More trips, with or without people.** In addition to taking people to where they need to go, future autonomous vehicles might also take extra "zero-occupancy" trips to get to their passengers, or to pick up and deliver goods. Taken to an extreme, this could add significantly more travel and create even higher levels of congestion.

» **Mind the gap.** An innovation fueled future is an exciting one, but it could also contribute to increased inequality and a widening income gap. Aside from job loss in the transport sector, privately operated transport services may or may not serve the needs of all travellers equally.

» **Guilt-free kilometres.** Faster adoption of electric vehicle (EV) technology could have potentially positive benefits for the environment, particularly with the reduction of transport related emissions. However, the means of producing and delivering the vehicle technology and the methods used to generate the energy consumed should continue to be considered into the overall equation when considering environmental impacts. One potential implication of widespread adoption of EVs is a further increase in vehicle-kilometres travelled as auto-users are less restricted by gas taxes and the guilt of contributing to emissions. This increased travel can result in unwanted congestion and wear and tear to our infrastructure.

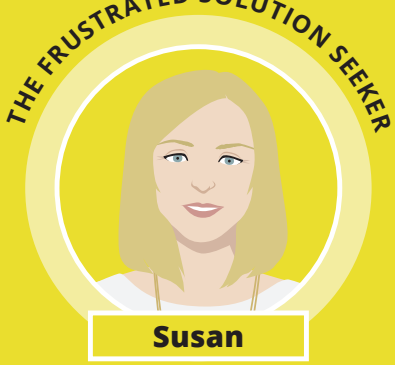
What can we do?

» **More BRT, more flexible.** BRT (Bus Rapid Transit) corridors allow for flexibility in serving a range of road based service types and operators, including shared AVs and on-demand services. In contrast, fixed rail infrastructure in lower density areas may struggle to compete with AVs and be less efficient if peak travel patterns shift towards off-peak travel.

» **Manage demand through appropriate pricing.** Added trips and longer travel distances result in additional cost to the region by way of lost productivity through congestion, wear on infrastructure, and waste of public resources. Pricing mechanisms can help to manage demand and keep this added travel in check.

» **Maintain transit as the backbone.** Even in a paradigm of autonomous vehicles and on-demand services, transit will remain crucial in moving people efficiently. Maintaining the public transit system, particularly the frequent and rapid transit networks, will be important in ensuring effective and affordable access for all.

» **Capture the potential of technology and innovation in transit.** Opportunities exist for transit operators to adopt some of the emerging technologies and innovations that are coming our way. For one, autonomous buses are autonomous vehicles too! As travellers' change to expect more on-demand services, it will be important for transit services to adapt to better serve their needs. Autonomous buses or shared and autonomous services can be designed to mitigate the first mile/last mile problem and make long-distance transit trips more competitive.



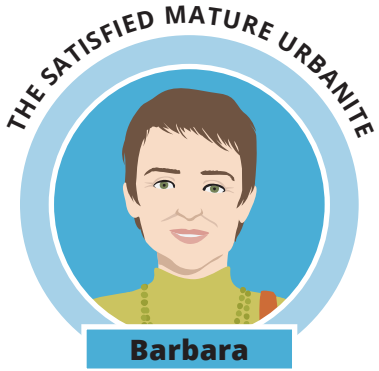
- *Highly-educated and affluent*
- *Values punctuality, convenience, safety, and personal space*
- *Finds travelling the region frustrating, and sometimes works from home*

A Day in the Future - Rapid Adoption of Emerging Technologies

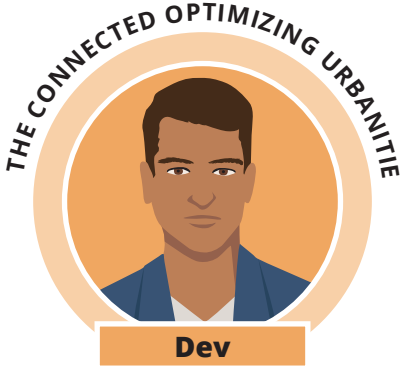
"I'm working from home today—I usually do that around 2 to 3 times a week now, depending on what I have going on. I find that I can squeeze much more into my days when I'm working from home. Back when the kids were younger, we lived in Mississauga, right by a GO Station, and my job was right in Downtown Toronto. Now that we're in Oakville, I have to drive whenever I do go to work in North York. Don't get me wrong— I absolutely love where we live now. Our house backs onto the water, and the property is much bigger than our previous one. It's almost like a house and cottage in one! The only downside is that I have to drive so much. The drive to work is especially stressful. Even paying the toll to take Highway 407, it can take anywhere from just over an hour to an hour and a half. It's getting even worse now that there are so many people trying to head up to Markham, Brampton, and Mississauga from these parts. I do wish it were easier for me to take the GO, but none of the services connect me to where I work. Sometimes, when I don't feel like driving, I hail an autonomous vehicle to come pick me up. Since the roads are so congested, it's probably not much faster than me driving myself, but at least I don't have to be paying attention the whole time. I was a bit skeptical of autonomous vehicles at first, but it's been growing on me. My autonomous vehicle rides to work and back are some of the most productive work sessions I've had. Being in the car alone gives me the personal space I need to think clearly and get stuff done. When I don't have work to catch up on, I use that time to read or rest. I'm not sure how many more years my car has in it, but I am thinking maybe we won't need to replace it, seeing that there are more and more autonomous vehicle carshare services on the road now. I wouldn't say that hailing an autonomous vehicle is cheap, but you get what you pay for and I would pay anything to avoid the stress of driving in congested traffic. It's definitely more expensive than taking transit, but hey, I'm basically getting a personal robot chauffeur!"

What others think

"Autonomous vehicles just make sense. I can call one up to get me to and from work, and call another to pick my kids up for soccer practice after school. Even if there is congestion, at least I don't need to be paying attention and can have time to myself."

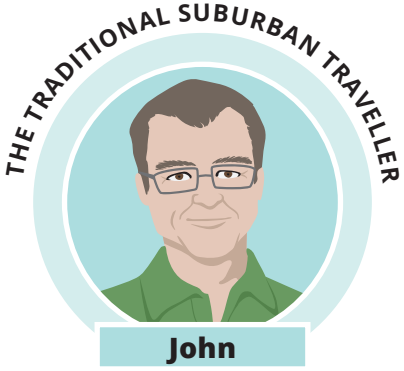


"Is it just me–or does it feel like there are more cars on the road? I sure hope that this is just from the initial excitement around autonomous vehicles. I think people will come to realize that transit is still the best way to move mass amounts of people–and the more environmental way too!"



"I like that I can call up a vehicle to come and take me to where I need to go. Not owning a vehicle allows me more flexibility with how I get around. It can be annoying sometimes to have to wait for a car to become available during peak times, but if I really need to, I could also hop onto a passing shuttle or take transit."

"Autonomous vehicles can get pretty expensive if you use it to get around every day, and there's also a bit of waiting during rush hour. I still prefer to ride my bike. It gives me more freedom, and now that most cars are automated, I don't have to worry as much about people who aren't paying attention."



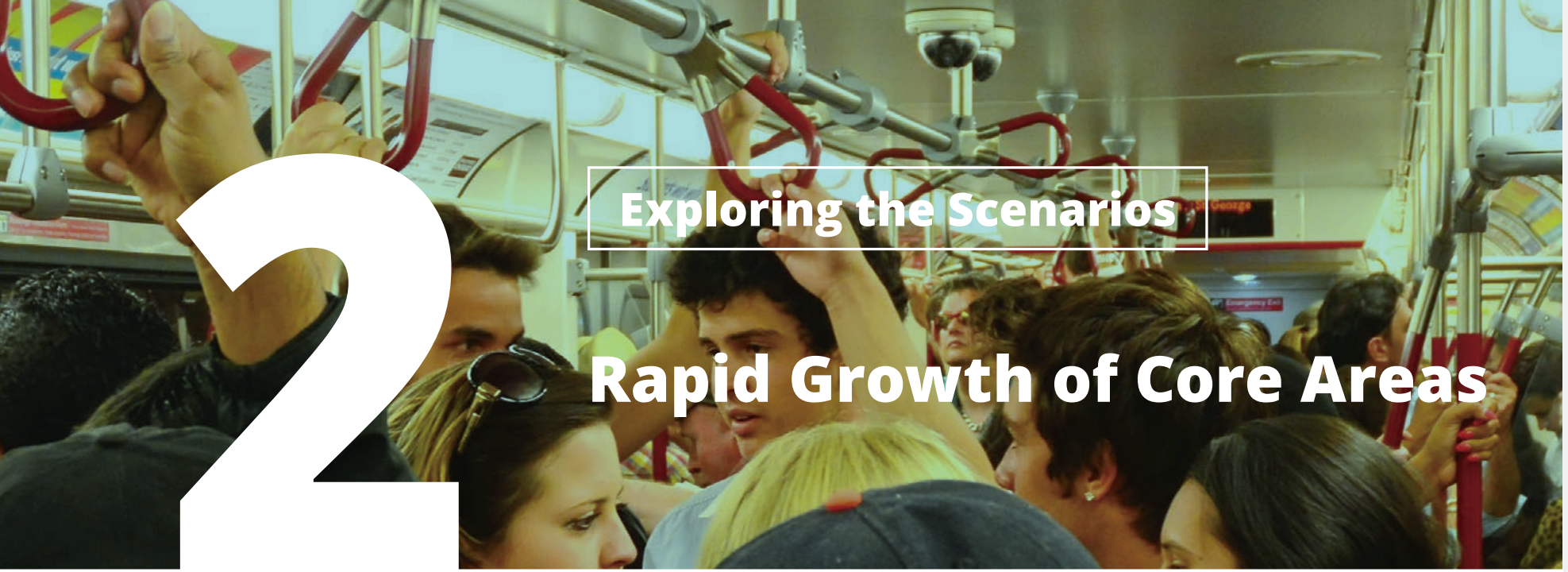
"Why do I need a self-driving car when I can drive myself? I can't understand why people love these autonomous vehicle things so much. First they take over our cars, now they take over our jobs."

With fertility rates well below replacement levels, immigration is the greatest driver of population growth for the GTHA.[6]

In 2011, 85.1% of visible minorities in the Toronto CMA lived in four municipalities: City of Toronto, Brampton, Markham, and Mississauga.[7]

Diversity has its benefits. Research has shown that, over the long-run, cultural diversity contributes positively to innovation and creativity.[8][9] High-tech metropolitan areas also tend to perform well on measures of cultural diversity.[10]

6 Hemson Consulting Ltd and IBI Group (2016)
7 Statistics Canada (2016)
8 OECD (2014)
9 Gertler et.al (2002)
10 Florida & Gates (2001)



Exploring the Scenarios

2 Rapid Growth of Core Areas

Some parts of the region have been more successful at attracting immigration growth than others. As more people and jobs move into the new centres that have popped up, roads in and around these areas have become more congested and overcrowded.

iStock.com/IMNATURE

In 2041

Once recognized as suburbs to the City of Toronto, a number of cities around the region have matured into urban centres in their own right. Benefitting from an enduring preference for urbanism, diverse cultural landscapes and booming creative and knowledge sectors, the municipalities of Brampton, Hamilton, Markham and Mississauga have risen as prime arrival areas for newcomers from other parts of Canada and abroad.[11] Positioned alongside the City of Toronto as core areas to live and work, these municipalities have generated heightened interest and drawn much greater levels of development than planned. Designated Urban Growth Centres within these municipalities have seen a boom in mid and high-rise commercial and residential development. As a result, despite significant intensification efforts by other neighbouring municipalities, other parts of the region have seen comparably less growth.

Deviating from the population and employment patterns that had been projected as part of the Growth Plan for the region, this new regional structure has created a mismatch between some infrastructure investments that have been put in place, and where growth in population and employment has actually occurred. As a result, transit services and infrastructure that connect between and into these core areas have seen overwhelming increases in ridership that have overloaded the system with delays and capacity issues. Elsewhere in the region, transportation infrastructure constructed in preparation for population and employment growth has been left underutilized.

While some people in the region appreciate the new found urbanity of these new core areas, others feel pushed out, either by rising housing prices or the loss of the suburban lifestyle that they had once enjoyed in these evolving communities.

Driving Factors

- As projected, immigration continues to be the main driver of population growth
- A preference for urbanism has endured through the generations and urban areas continue to be seen as desirable
- Newcomers, particularly those in the knowledge and creative class, are drawn to parts of the region with greatest socio-economic diversity and cultural richness
- Growth occurs faster in some parts of the region than others, particularly in and around the City of Toronto, Brampton, Hamilton, Markham, and Mississauga

11 Core municipalities have been chosen only as proxies for exploring the effects of clustered growth in select areas and do not have direct impact on the prioritization of projects within the plan

What does this mean?

» **If you build it, they … might come?** Building infrastructure is important for the growth and development of the region, but on its own, it is not enough to create the places where people want to live, work and play. Without supporting land use, community building, and placemaking, some areas around coming infrastructure corridors might see less growth and use than projected.

» **Bursting at the seams.** Continued growth focused around already built up areas and corridors of the region could put added pressure on already strained systems. Capacity and reliability are major concerns today, and will likely continue to be if population growth in and around these parts of the region persist. In many cases, lower-income families who use transit for more of their overall travel (not only for commuting) will be priced out and displaced by higher-income households, resulting in less transit usage.[12]

What can we do?

» **The best transportation plan is a good land use plan.** Transportation solutions are more effective when matched to appropriate land uses. In addition to planning for the provision of new infrastructure, all levels of government in the region need to work together to ensure that the appropriate land uses are in place to ensure that city building objectives for the region are met and that these projects are successful. Housing affordability and anti-gentrification policies should also be considered as a key component of land use planning.

» **Strengthen the weakest links.** To ensure the transportation system operates effectively, we must think not only about expanding the infrastructure, but also about building up and strengthening what is existing. The transportation system is an interconnected network, and breakdowns can have trickle down effects throughout the system. Strategies that improve the reliability, capacity, efficiency, comfort, and ease-of-use of the existing network must be given greater consideration.

12 Dawkins & Moeckel (2016).

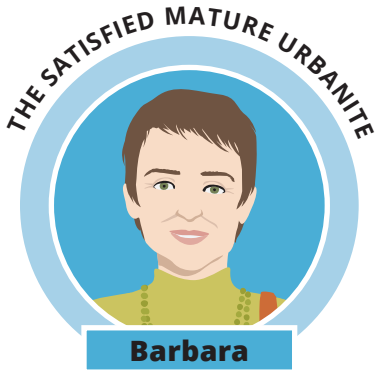
- *Car-lover and homebody*
- *Values convenience, speed, and control*
- *Willing to drive long distances (up to 50 km one way)*

A Day in the Future - Rapid Growth of Core Areas

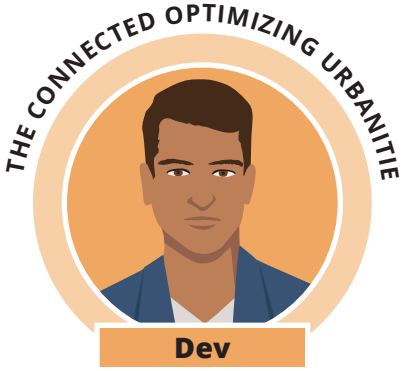
"How is it even possible that there are so many cars on the road? I remember when I could get from my house in Burlington to work in Brampton in just over an hour. Nowadays, it takes me about an hour and a half on a good day, and sometimes even longer if I don't get out of the house early enough. I thought working in Brampton instead of Downtown Toronto would mean that I could avoid driving in congested downtown traffic, but it seems like the downtown has come to me. It used to be pretty easy to find parking around work in the mornings, but the two parking lots on either side of my workplace have now been turned into more office buildings. The new buildings have a bit of underground parking, but now that there are so many more people working around here, they now charge for parking and it's also not so easy to find a spot. I'm starting to get tired of having to search for parking every morning–maybe I should just spend a bit more money and rent a reserved parking spot. My coworkers were telling me the other day that they've been using this app that lets them rent parking spots directly from people who live in the area and don't need their parking spots during the day. I think I will have to look into that a bit more. My kids keep saying I should just give up my car and try taking a self-driving taxi to work since it would cost about the same as me driving my own car and paying for parking, but I don't know if I can really trust those things. I remember when they first started making these self-driving cars, there were a lot of accidents, especially when it snowed during the winter. There haven't been as many serious accidents lately, but I still don't like the thought of not being in control. I also don't like that I have to wait for the car to come to my door instead of having it right there in my driveway when I get up in the morning. The kids use self-driving taxis all the time and say that it usually doesn't take that long for one to arrive, but you never know how many people are going to be using the service on a given morning. I like to be able to travel when I want to travel, so I don't think I am going to take the risk. I have heard that many car-makers are planning to phase out driven cars soon. I'm really not ready to switch over to a self-driving car yet, so let's hope my car lasts me at least until I retire!"

What others think

"Many companies have been moving into Mississauga. Maybe I should try to relocate or find a new job here so I can work closer to home. Less time commuting will give me more time with my family."



"The city is alive with activity! I love seeing so many people take transit–even if it means I sometimes have to wait a few trains or buses to get on. This is a good direction to go for the environment, and I am sure they will add more vehicles eventually. I don't mind walking either. Now that I work less, most of my activities are just a hop and a skip away from home."



"My partner and I have been looking at some houses in Brampton and Mississauga. There have been lots of development going on, and it's become much livelier–somewhat like Downtown Toronto. There are also a lot of emerging job opportunities up there, and will let me live closer to family."

"Should I move home or at least back to Hamilton? I just started my job here in Downtown Toronto, but it looks like there are a lot of new jobs down there that would be really cool to work on. Rent would also be cheaper–or free, and I wouldn't have to share a bathroom with two other people."

"My department got relocated to the new Markham office last month. The office is nice and the area is quite vibrant, but it is now an even further commute, and finding parking is difficult."

Global population displacement as a result of climate devastation is a major concern worldwide. Droughts and rising water levels in various climate change hotspots threaten the basic livelihood of vulnerable populations. [13] [14] [15]

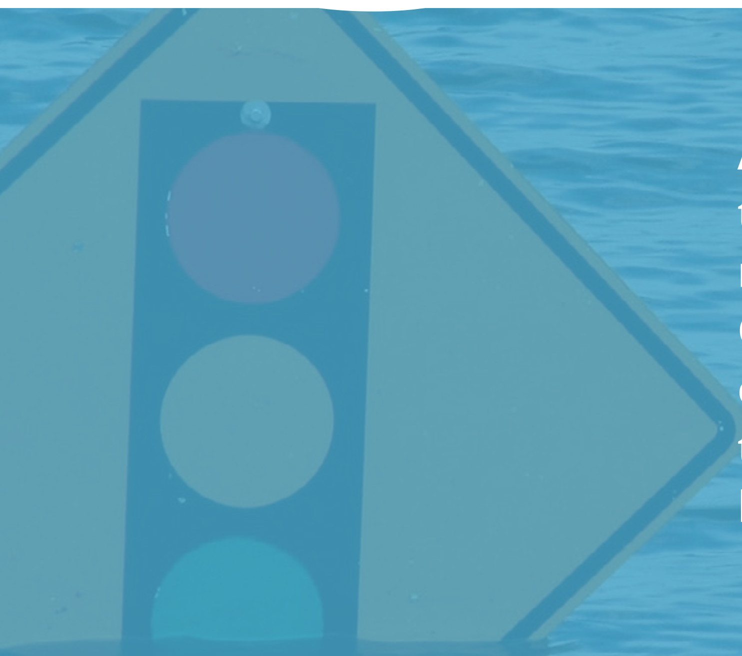
Climate change is already costing the region. Each summer, extreme heat creates sun kinks on rails that force services to slow.[17]

Although Ontario is expected to largely escape the impacts of rising sea levels, higher average temperatures will mean warmer winters and hotter summers. Extreme weather events will also likely have shorter return periods, recurring more frequently than before.[16]

13 UNHCR (2015)
14 Becklumb (2010)
15 The Government Office for Science (2011)
16 Warren & Lemmen (2014)
17 GO Transit (n.d.)

Exploring the Scenarios

3 Extreme Climate Change



Average global temperatures have increased faster than previously projected. Sea levels have risen, and many coastal cities around the globe have flooded. Climate devastation has brought a large number of climate change refugees from around the world to the GTHA, pushing the regional population to new levels but with limited economic growth.

Photo by Kelly Sikkema on Unsplash.com

In 2041

Efforts to halt climate change in its tracks and reverse its effects over the past few decades have failed, and its impacts have now arrived in full force, even sooner than previously expected. Glaciers are melting at an accelerated rate, causing sea levels to rise and flood over many coastal cities around the globe. The world has experienced a surge in climate change refugees, displaced from regions devastated by severe weather disasters. Canada has opened its borders to climate change refugees and has actively engaged in population resettlement. Being an inland region that has been relatively sheltered from the worst of the climate change impacts, the GTHA has become a primary location for resettlement of climate change refugees from around the globe. As a result, regional population has grown well beyond projected levels, putting greater pressure on the region's resources. A severe housing crisis arises as the region struggles to keep up with the influx of people entering the region through formal and informal means. As many government and social resources are located in Downtown Toronto, it experiences a particularly large increase in population.

While the GTHA is relatively unscathed by climate change, it has resulted in warmer winters, hotter summers, and heavy precipitation in the region. Multiple freeze-thaw cycles in the winter cause roads to crack and crumble, while frequent extreme heat days during the summer cause major delays to the transit system as rails buckle and engines breakdown from the heat. While many people clearly link the burning of fossil fuels, and by extension driving, to global climate change, they continue to drive as it is seen as much more reliable than transit. Despite improvements to battery technology for electric vehicles, excess reliance on in-car air conditioning systems and the impact of extreme heat, range anxiety remains a major concern and has deterred most car drivers from making the switch to electric.

Driving Factors

- Average global temperatures have risen faster than expected, setting off climate devastation and causing mass global population displacement
- Canada and the GTHA open its borders to climate change refugees, resulting in an increase in the regional population beyond projections
- Regionally, more severe weather events, warmer winters and much hotter summers have shortened the lifespan of infrastructure
- Energy consumption increases drastically, particularly during the summers, as people rely more heavily on air conditioners and driving to stay out of the heat

What does this mean?

» **Bumpy road ahead.** Warmer winters could potentially mean more freeze-thaw cycles as temperatures fluctuate about the freezing point. These conditions are particularly damaging to infrastructure as expansions and contractions can cause cracks and potholes to form. Frequent cycles over an extended period of time might make maintenance more of a challenge.

» **Driven by weather.** Frequent interruptions from weather can have lasting impacts on traveller behaviour. Inadequate shelter from the elements, uncomfortable conditions, and unreliability, all of which impact transit heavily, may motivate some travellers to rely more on personal vehicles over which they have greater control.

What can we do?

» **Design for all weather**. Taking a climate resiliency approach, changing weather patterns should be a chief consideration for the design of all new infrastructure in the GTHA, from where new alignments are located to the materials that are used, the design considerations and tolerances, and the technologies and systems that are put into place.

» **Network redundancy.** Redundant networks are resilient networks. When interruptions disrupt a part of the transportation system, alternative paths help to keep the system moving. In addition to expanding the reach of the transportation system, creating network redundancy to bolster the resiliency of the existing transportation system should also be a core objective of the region's plan. Planning for redundancy and flexibility will naturally require greater emphasis on building up frequent bus transit corridors instead of relying on construction of fixed infrastructure alone.

» **State-of-good-repair as a priority.** Maintaining the infrastructure we already have is vital to keeping the region moving. Alongside expanding the reach of the transportation system, maintaining a state-of-good-repair on our transportation infrastructure has to remain a priority.

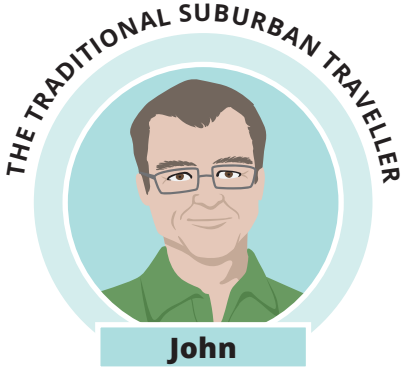
- *Intellectual and environmentally conscious*
- *Values punctuality, safety, and affordability*
- *Unlikely to cycle or use ridehailing services*

A Day in the Future - Extreme Climate Change

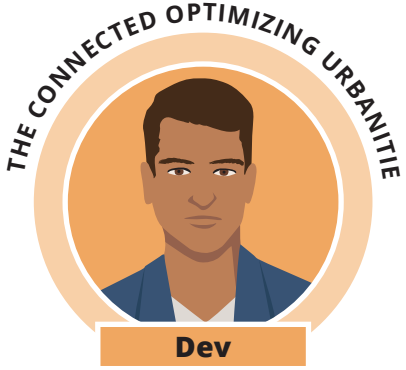
"Oh dear, another heat warning today? Poor Buster hasn't been on a good long walk in days. It has been very difficult for us not being able to go outside, but I am sure it has been much worse for those having to live out there on the streets. For the most part, I walk everywhere I go and have seen a noticeable increase in the amount of people in the city, and also of homelessness on our streets. I am thinking some of these people must be climate change refugees. I know the government has been helping to relocate people from climate devastated regions, and there have also been people moving in from other parts of the country and up from down south. The influx of people is happening so quickly, I just don't know if the region will be able to keep up. I really hope they figure out how to accommodate everyone soon because I don't know when this flow of people will end. It seems like every single day there is news of another major weather event wreaking havoc somewhere in the world. We've been fortunate enough here in this region to have come out relatively unscathed so far. The worst of our issues have been infrastructure breakdowns and extreme hot and cold weather days that have kept people indoors, which are mere annoyances compared to what others have faced. Just last Friday, I was trying to get out to Burlington for dinner with my daughter and grandkids, but was a whole hour late because the train slowed to a crawl. I was chatting with the Customer Service Ambassador on my train, and apparently when it gets hot enough, the tracks can warp and turn into something like spaghetti, which sounds absolutely frightening. I'm a punctual person and I really don't like being late, but at least they were being safe. During the winter, cold snaps make the ground really icy, and I am afraid to go outside because I don't want to slip and fall. I am so glad that the building I live in has a good mix of uses and gives me access to lots of retail and services without having to step outside. I am hopeful that they will figure out a way to improve our infrastructure soon so that we won't have as many delays and service disruptions."

What others think

"The trains were delayed again today because of the heat? Now I'm definitely not going to take transit to work. At least if I drive myself, I can stop off to pick up groceries while I wait for traffic to subside. This weather has been nothing but trouble."



"Driving these roads feels like a ride on a roller coaster! Is it just me or are the roads a lot more broken up than they used to be. Shouldn't the government be taking care of this? Any bumpier and this could get dangerous."



"Driving in the region is a bit frustrating, especially when the roads are so broken up, but I have no other choice with the weather being so adverse all the time. Waiting for transit, your clothes either get soaked by torrential rainfall or by sweat from the extreme heat. It's not a good look, especially when I have to meet with clients."

"Another heat warning? I guess I shouldn't bike today. I hope this subsides soon–taking transit is relatively cheap, but it still eats into my overall budget. Days like this make me wish I had a car so that I could blast the air conditioner as high as I want. Then again, cars are probably why we have this weather in the first place."

"I am glad I have the option of working from home. It's so hot outside that my clothes get soaked as soon as I step out the door. Tomorrow I will have to drive in to work for a meeting, but at least I will have a working air conditioner!"

Precarious employment in the GTHA is on the rise. Of the jobs created in Canada from October 2015 to October 2016, 89% were part-time positions.[18]

Both workers and consumers in the on-demand economy tend to be young and educated. In a survey of the Toronto area, 71% of respondents were under 45 years old, and 90% indicated that they had attended post-secondary education.[19]

Close to half of Toronto Area on-demand workers surveyed live in the City of Toronto (in the old city and post-war suburbs). The remainder live in the edge cities around Toronto.[20]

18 Johal & Thirgood (2016)
19 Block & Hennessy (2017)
20 Ibid.

Exploring the Scenarios

4 On-Demand Economy

Satisfying the continuing demand for instant gratification that was first unlocked in the age of smartphones and mobile applications, the economy has experienced a widespread shift towards on-demand formats. There is a rising expectation for rapid delivery of goods and services. Precarious employment has become the norm across industries and resulted in economic instability among many segments of the population.

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In 2041

Need someone to fix a leaky pipe, help you add that extra zest to a report, or fill a role on an upcoming project? There's an app for that! Online platforms that connect people to services have soared in popularity over the last several decades. Equipped with the ability to easily and affordably connect with talent both locally and abroad on an as-needed basis, employers are opting for fewer full-time employees and instead are relying more heavily on temporary contractors that are matched specifically to the knowledge and skills needed at a given moment. With few long term employment opportunities remaining, the majority of people have taken up freelancing, often having to hold multiple gigs at a time in order to make a comfortable living wage. This has resulted in an overall decrease in job security and increased inequality. With limited experience and added competition from talent abroad, the youngest parts of the workforce are hit particularly hard, despite being highly educated. It takes time to get reviews and ratings on the on-demand employment apps up to a level that attracts the attention of employers, so some opt to provide their services for free or at low cost, exacerbating the situation.

With already high property prices, some people take informal households to a new extreme, filling houses and apartments with many more roommates than rooms. Density in urban areas, particularly the City of Toronto, continues to increase as employers see these as areas that provide the greatest access to an on-demand talent pool and workers find it easiest to move from gig to gig over the course of a day. Travel in the region becomes more sporadic and unpredictable as people no longer adhere strictly to a 9 to 5 workday and move between various employment areas and co-work locations instead of just from home to work and back.

Driving Factors

- On-demand platforms that connect people and jobs have expanded beyond the service sector to also impact the knowledge and creative sectors
- As the supply of full-time jobs has decreased, casual and precarious employment become the norm, particularly for the youngest members of the population
- Against projections, population continues to densify mainly around Downtown Toronto where people have the greatest access to gigs and employers to the largest talent pool
- Travel becomes more sporadic and less predictable as people travel at all times of the day and without a fixed pattern

What does this mean?

» **Work to work to work.** Travel patterns may get more sporadic and unpredictable as people travel between various jobs. Instead of the conventional home to work to home travel patterns that are common among a predominantly full-time workforce, the region may see people going from home to work, then to a number of other work locations, before returning home again at the end of the day.

» **"Plateau" hours.** Instead of having peak periods of travel in the morning and afternoons, the transportation system may remain consistently busy throughout the course of the day as people move about between jobs and weekend travel has become similar to weekday travel. This pattern of movement would be markedly different from the typical peaking that is observed with today's mainly 9-to-5 workforce.

What can we do?

» **All-day access.** Many parts of the current transit system operate according to the peaks in demand that occur in the morning and afternoon rush hours, and typically decrease or do not operate at all during the midday. With greater travel demand throughout the day, greater focus would have to be placed on adding service to provide travellers with access to viable transport options at all times of the day.

» **A role to play in on-demand transport.** Growing expectations for more on-demand services both in travel and in the delivery of goods and services could have major impacts on the transportation system. Although most of these services are currently privately operated, the public sector has a role to play in ensuring that they contribute to positive outcomes for the broader public.

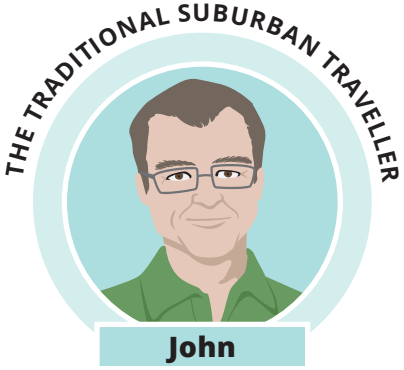
- *Young and active, but with lower income*
- *Values affordability, safety, and reliability in travel*
- *Open to trying new things*

A Day in the Future - On-Demand Economy

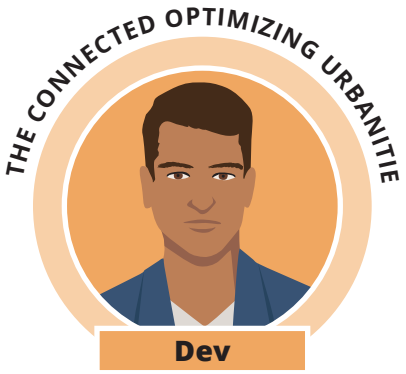
"Hey, I can't chat for too long. My next gig starts in an hour out in the west end and I'd like to grab a bite first before I head into the meeting. This next job is going to be really cool. I can't give too many details, but it's finally a job in my field! Exciting, right? After spending the last 12 months picking up random gigs, it's nice to get back into the field I know best. I've been trying to get my own side-business up and running, so these jobs have been helping to pay the bills. Being Founder and CEO is hard work, even with the company being just me right now. The gig I'm heading off to now will be a short project, and just a contract role, but maybe if I do a good enough job they'll bring me back on the next one, or possibly even keep me on full-time? I know, I know, full-time positions are super rare now, but a girl can dream can't she? I feel lucky enough that they chose me off the app. A lot of companies have been sending the work overseas because people charge a bit less. I've tried to look for overseas projects too, but it's just really hard to compete with their rates, especially now that I'm paying for my own rent. I'm just glad this company I'll be working with still values brainstorming and collaboration in person. Don't get me wrong! I'm pretty good with technology, but working with people over teleconference or virtual reality meeting rooms just feels different than being in a room with a bunch of people and doodling on a smartboard or something. You know, like we did in class? Maybe I'll get used to it after a while, who knows! Actually, mind helping me check online to see how busy the roads are right now or if the trains are running on time? My phone battery is running low, and I'm going to need it to find the office. It's amazing how many people are moving around the city throughout the day. I never know when a good time to travel is, it really changes from day to day. Actually, if it's too busy, maybe I'll just bike. I'll have to get going a little bit earlier, but at least I know I'll get there on time. It would save me some money too! Keeping all these gigs going at once really burns through my transportation budget. Alright, I've got to run now! If you want to chat more, I'll be working out of that co-working space down the street from my house later tonight. The roommates are having friends over, so I'm going to step out for the night to get some work done. Meet up around 8 PM? See you then! Wish me luck!"

What others think

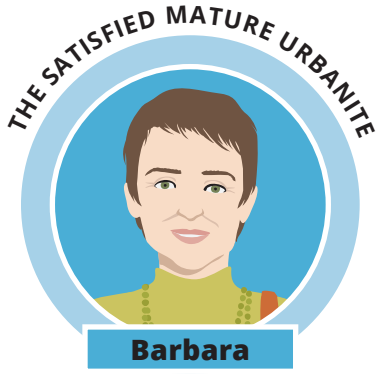
"It saves me so much time being able to order things on my phone and have them delivered straight to the house or to get someone to help me run errands. I'm surprised how reasonably priced these services are, but I guess with so many people in the market offering these services, there is a lot of competition."



"Use the internet to order my groceries or get someone to come over and walk my dog? No thanks! I can do it myself! Young people these days sure have strange ideas of work."



"The gig economy fits well with my personality. It's spontaneous and fast-paced–every piece of work is different. I've been lucky to find a lot of gigs in my field, but it's still a lot of work. It also means that I have to travel a lot at odd times when there isn't much transit where I'm going. When my partner has the car, I usually use carshare or hail a ride on my phone."



"I am surprised the trains are still so busy in the middle of the day. There seems to be more and more people out and about throughout the day. Last week, I was going to an appointment during the day and couldn't even find a seat on the subway. It's like never-ending rush hour! I think the city needs more transit service."

"I love the convenience of getting help with errands through an app. I've even used on-demand services to find people for projects at work. My only complaint is that roads seem more congested, even during odd times. Leaving the house earlier or later makes no difference."

In 2015, Ontario households spent an average of $11,812 on transportation—about 89% of this was spent on private transportation, while the remaining 11% was spent on public transportation.[21]

Road usage charges already exist in other parts of the world. Trucks in Germany are charged for the distance driven.[22] In New Zealand, vehicle users who do not pay the local fuel tax are required to pay a road user fee.[23]

The long-run impacts of private operators in the mobility sphere are still unclear. While the services appear complementary to transit in some contexts, transit ridership and congestion in some cities has also suffered as a result.[24] [25]

21 Statistics Canada (n.d.)
22 AGES Maut System GmbH & Co. (n.d.)
23 New Zealand Ministry of Transport (2016)
24 Schaller (2017)
25 Henao (2017)

5

Exploring the Scenarios

User Pay Economy

Increased pressure on government budgets and private sector entry into public service provision have ushered in the spread of user pay models across many services, including transportation. The region has further densified and has made the transportation system operate more efficiently, but at the same time, also somewhat unaffordable, particularly for lower income households.

In 2041

Very high demand for services and increased pressures on government budgets, coupled with private sector entry into services that have traditionally been provided by the public sector, have led to a spread of user-pay models. Broad-sweeping subsidies are now a thing of the past, and much of the cost associated with supplying and delivering services have been transferred onto the user. The impact has been widespread, affecting many service areas including water and wastewater, electricity, and transportation.

In particular, road usage charges have become more common in many cities around the world as a means to reign in excessive travel by on-demand mobility services and autonomous vehicles. Aggressive measures to decrease transportation-related emissions have made driving much more expensive. The high cost of travel by car has motivated at least some parts of the population to locate in more urban environments or at least closer to affordable transit options. This has made the price of property around transit stations skyrocket. Informal households made up of many individuals or multiple small families become more common as people try to reduce the cost of housing. For others, particularly those with larger families who cannot afford to live close to transit, there is little choice but to live further away from these transit corridors and try to minimize transport costs in other ways. Walking, cycling, and carpooling see significantly more use as primary modes of transport as people seek to cut back on their transport costs. Telecommuting also sees increased use as people try to reduce their need for travel.

Key Factors

- Governments experience increased budget pressures from high demand for services
- Private sector entry into traditionally public services, such as transportation, has further undermined government's ability to recover costs
- Population and employment concentrates around urban areas and transit infrastructure where there is easier access to affordable transport options
- Travellers in the region adapt to other modes and try to reduce their travel in order to keep their transport costs low

What does this mean?

» **Driving by necessity.** Pricing without complementary measures that ensure equity of access may make the transportation system much less equitable. The parts of the population with the least amount of choice would suffer most as they would be priced out of the transit accessible parts of the region, to areas where they have little choice but to drive.

» **"Mobility Poor".** As the cost of mobility increases, households may have to dedicate a larger portion of their usable incomes towards mobility, competing with other necessities such as food and housing. Low-income families would be impacted the most, and if left unchecked, the high cost of physical mobility could end up being a barrier to economic mobility.

What can we do?

» **Investing in alternatives.** Any pricing on transportation must also be coupled with investments in alternative modes of transport so that people continue to have viable options for getting around the region, even without a personal vehicle. As a principle, revenue generated from pricing on transportation should be directed back to improving the transportation system in a way that improves mobility and choice for all.

» **Harness the potential of bus.** Bus networks are flexible, scalable, affordable, and relatively quick to implement. With limited additional infrastructure, buses can be used to form frequent and rapid transit networks. In parts of the region where needs are immediate, buses can provide an alternative to higher-order forms of transit that may take longer to implement. Frequent and express bus networks should be elevated and highlighted as a part of the rapid transit network.

» **Invest in walking and cycling.** Active modes such as walking and cycling provide affordable ways for travellers to get from place to place. Appropriate infrastructure can make these active modes, particularly cycling, effective for trips both short and long.

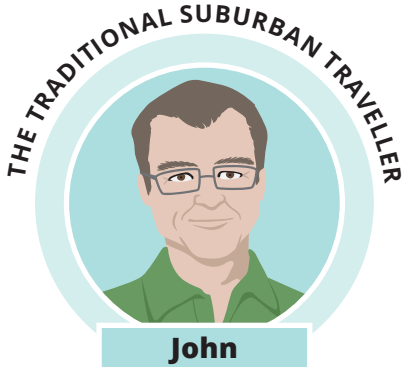
- *Educated, spontaneous, and ambitious*
- *Usually drives or takes transit, but not a fan of either*
- *Likes exercise but not while commuting*

A Day in the Future - User Pay Economy

"Man, I just took a look at my credit card bill this month and the transportation portion is massive! My partner is not going to be happy with me. Now that we have our son, we've been trying to save up for a bigger place, so our budget has been pretty tight. I think we've done a fairly decent job of cutting down on some things, but I can't seem to get a handle over my transportation costs. There are all these extra fees now for travelling by car around the region, and it's supposed to be more expensive at different times of day or on specific roads and in various areas of the city, but how can I adjust when work needs me there at a specific time? I'm basically on the go 24/7, so it's not exactly easy for me to avoid travelling at certain times or to certain places. My partner got me a new commuter bike and PRESTO card for my birthday last year—trying to drop a hint maybe? I get it, we need to save money, and I should take transit and cycle more instead of always hopping into the car or calling an on-demand service. My partner has a fairly fixed schedule and works out of one office location downtown where there is a shower and change room, so taking transit during the colder months and cycling for the rest of the year has been working out well. For me, I need to visit different sites all the time, and there isn't always a shower or change room available. I'm not going to sit in the office all day with my hair a mess and my clothes dripping wet. Transit doesn't always take me where I need to go, and can sometimes be unreliable. It's not like I'm attached to my car—I definitely don't depend on driving as much as my parents did when I was growing up—but it's just what's easiest for me right now given where we live and where I need to go. Plus, sometimes we just need a car when we take our son out with us, and lugging the stroller and bags of baby stuff around is no fun, especially when there's no elevator. I really don't know what we're going to do when we move. We've thought about looking for a house within the city so we can keep our transportation costs low, but I'm sure everyone else has been thinking the same way and it has been driving the housing prices up. I should really look for a job that will let me work from home sometimes so I won't have to travel so much."

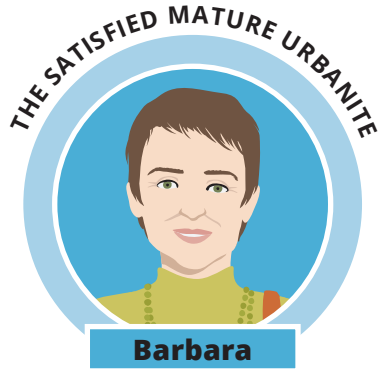
What others think

"Driving is so expensive now, we try to limit it as much as possible. We can't afford to move closer to the city, so my wife and I drive together in the mornings to drop off the kids at school, and then go to the GO Station. The trains are really packed, but at least it costs less than driving."



"This is an outrage! I have paid my taxes for over three decades, and now they are trying to charge us more taxes on driving? Don't they charge us enough? The city will definitely hear it from me!"

"I'm glad there's no tax for using my bike! Otherwise I would need a second job just to pay for the fees to get to my current job–especially with rent being so expensive now. I hope that the money really does go towards transit investments–I think we really need it."



"I don't drive, so the new driver fees don't impact me, but I do take transit and the prices have gone up a bit–at least when I have longer to travel. I know taxes are no fun, but I think this is a good thing for the region and the environment. We need people to drive less, and more money for transit investments."

"I don't love having to pay more taxes to drive, but if it's going towards transportation investments like they say it is, I guess I can deal with it. The plus side is that the roads aren't as congested as they used to be, and I can get around relatively quickly."

From 1950 to 2015, Canada was one of the major net receivers of immigrants in the world. Projections suggest that it will continue to be a major receiver of immigrants through to 2050—what would happen if this pattern shifts? [26]

The world continues to urbanize. It is estimated that by 2050, another 2.5 billion people will be added to the world's urban population, and nearly 90% of this increase will be concentrated in Asia and Africa, rather than in North America.[27]

More than three-quarters of Canada's exports are traded with the United States making the country's economic performance strongly tied to that of our neighbours to the south.[28]

26 United Nations Department of Economics and Social Affairs (2015a)
27 United Nations Department of Economics and Social Affairs (2015b)
28 Hemson Consulting Ltd and IBI Group (2016)

Exploring the Scenarios

6 Economic Decline

Rapid social and economic progress in what have been developing parts of the world, coupled with high corporate taxes, trade barriers, and general stagnation across the country has made the region less attractive to would be immigrants. Population further declines as people emigrate out of the region in search for economic opportunities, leaving behind an aging population.

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In 2041

Decades of social and economic progress has enabled previously under-developed parts of the world to rise in the ranks to become major global powers. In contrast, high corporate taxes, trade barriers and general stagnation across Canada and the United States have made North America less attractive as a place to conduct business. Locally, automation has also played a part in the decline of employment opportunities, particularly in the manufacturing and service sectors.

Population in the region, having long depended on immigration to sustain growth, stagnates as immigrants become more drawn to settling in other parts of the world rather than Canada. Further contributing to this, dwindling opportunities in the region have also pushed younger parts of the regional population to emigrate in search of better opportunities for education and employment. Left behind is a smaller than projected population that is significantly aged and less engaged with the regional economy.

With reduced levels of employment and economic activity across the region, people in the region also make fewer trips. Reduced ridership for transit services across the region have forced transit agencies to cut down on services, particularly in low density suburban neighbourhoods. Areas that experienced major condo booms in the late 2010s have now fallen to slums as buildings are left in disrepair. This has introduced new fears around safety and security for people walking and cycling. Despite the technology for autonomous and on-demand mobility services being available, the lack of critical mass for travel makes the regional market less lucrative. Many companies that had at one point set up operations in the region have retreated. Although car ownership remains expensive, many travellers in the region have no other choice but to drive, relying on older cars, that are in turn, more expensive to maintain with worse fuel economy than the newest models.

Driving Factors

- Countries previously considered developing have made great strides to progress socially and economically with improvements to education, civil liberties, innovation, healthcare, and social welfare
- High corporate taxes, trade barriers, and general stagnation in North America have caused Canada to fall in global rankings
- Immigration is drawn away to other countries, while local populations, particularly younger generations, emigrate in search of better opportunities
- The region experiences further decreases in economic activity as the population decreases and ages
- Transport service providers, including transit agencies have difficulty sustaining services

What does this mean?

» **De-centralized business district.** A decline in economic activity throughout the region may spell disaster for traditional central business districts, such as Downtown Toronto. A shift of financial, insurance, and real estate sectors to places outside the region could result in the hollowing out of the once dense economic center. With much of the existing transit infrastructure oriented towards Downtown Toronto, a future that is not oriented around this central business district would see significantly decreased use of the existing infrastructure with very limited ability to repurpose this infrastructure.

» **Aging-in-place without options.** No longer able to drive and with limited and declining levels of transit service, seniors who look to age-in-place, particularly in low-density suburban areas, may find themselves with few options for getting around as the general economic decline has discouraged carsharing companies from expanding operations in the region.

What can we do?

» **Match demand with on-demand.** Conventional transit is challenging to operate in low-demand areas as there is often a trade-off between faster operating times and easier access for passengers. On-demand services, such as ridehailing and microtransit are better suited to meet the demand in these areas. In face of decreasing densities and more challenging operating environments, transit agencies could take inspiration from on-demand service providers to offer services that are better matched to demand.

» **Accessibility from door-to-door.** Universal accessibility across all parts of a trip is important now, and will be even more important as the population ages. Further emphasis could be placed on the accessibility of transport options right from the origin to the destination.

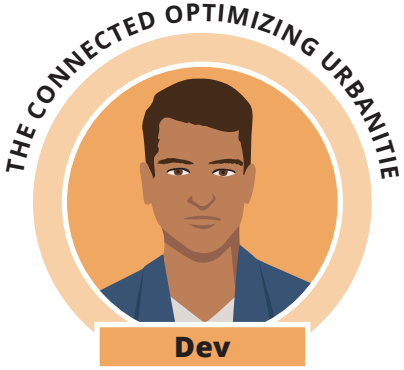
- *Hard-working and family-oriented*
- *Values safety, cleanliness, value, and speed*
- *Likely to keep driving, but open to taking transit*

A Day in the Future - Economic Decline

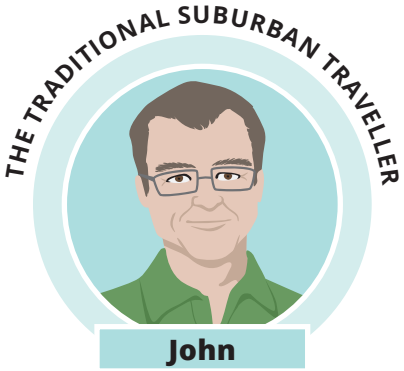
"My commute nowadays is pretty smooth. I think the total time between leaving my house in Mississauga to parking my car in the parking garage down the street from my office in Toronto takes just about 30 minutes. That's pretty good considering that back when I first started working in my early twenties, it would take me close to an hour and a half to drive pretty much the same route from my parents' place. Most of the time, I would just park my car at Cooksville GO in the mornings and take the GO Train instead. I actually did that for quite some time, and didn't start driving until a few years back. We bought this rust-bucket second-hand—maybe third—out of necessity. I wanted to get a new model, but it's quite a lot of money. I really hope this car doesn't break down and end up costing us even more.

A lot of jobs have gone overseas and there just isn't as much traffic on the streets anymore. My job is stable for now, but I do worry for my kids. My eldest daughter is 15 now, and in a few years she will be off to university. Back in my day, schools in North America were considered top notch. However, over the last two decades, universities in Asia have improved a lot, and some do even better on international rankings than the ones here. I am concerned that if my kids study here, they will not be able to compete with those who are studying abroad, and will have a harder time finding work. There's also a concern that our economy will continue to do as poorly as it has the last few years. All these trade barriers were supposed to help keep jobs here, but it doesn't seem to be helping, especially when all these local production plants are going fully automated. I've also put some thought into relocating the family altogether, but am not sure if my mother would be willing to move with us. She lives on her own in an apartment building where she has a good network of friends. She's fairly independent, but I worry about what she will do as she gets older. She doesn't drive and doesn't trust those self-driving taxis, so she usually walks or takes transit wherever she goes. However, with transit ridership going down in recent years, the transit agencies have been struggling to keep routes operating. I do worry that if we move away, there will be no one to drive her to appointments or to take care of her in general. With such a large elderly population, you'd think they would have better services available to cater to their needs."

What others think

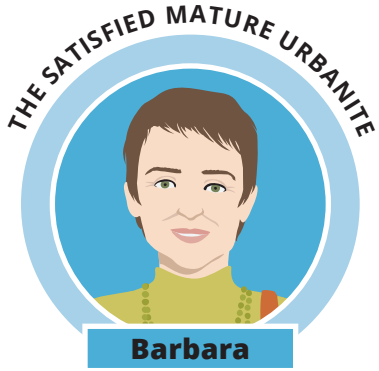


"We've had to buy another car–second hand of course. With the economy doing so poorly, a lot of carshare and ridehailing companies have dialed back their services. Transit is not doing so well either, so we don't have many other choices but to drive. If things continue like this, I might have to start looking for work abroad."



"Early retirement always sounded wonderful, but not in the way that it is happening now. This is my last week at work—quite a few of us got pushed to retire early. Money is going to be tight from now on. If my wife loses her job too, we're going to have to downsize and maybe get rid of a car."

"I've moved my stuff back to my parents' home, and in two weeks, I'll be leaving the country for my new job. I'm pretty nervous, but also excited. A lot of other people have been leaving the region as well. The city seems to move at a slower pace than it used to."

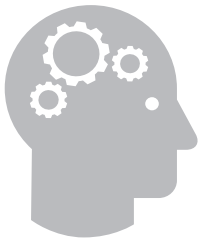


"Our budget is really tight nowadays. I don't need to travel for work anymore, so I try to walk to my activities whenever I can. It's unfortunate that transit service has decreased, but I guess they have no other choice now that there are fewer people in the region to ride transit."

"Now that they've cut down on the level of service, it's going to be even harder for me to take transit. I would rather not have to drive, but I guess I don't have many other options now. At least congestion is not as bad now with so many people moving away from the region."

Creating a Resilient Plan

How the Scenarios Were Used



Strategies and Actions

The scenarios presented in this document contributed to expanding the range of policies and programs that were explored as part of the 2041 RTP. By thinking through the alternative futures, it became clear that the plan required a robust set of strategies beyond transit infrastructure alone. Building on the insights of the Thought Leader Panel, a range of strategies and actions, such as frequent transit networks, land use policies, and pricing were explored in greater detail.

Resiliency Evaluation

Once a short list of five potential investment portfolios for the RTP were developed, a resiliency evaluation was conducted to assess how each package of strategies and actions would perform under the stresses of the various scenarios. Travel demand modelling was conducted using population, employment, land use, and transport assumptions that were adjusted from the base case of Growth Plan forecasts (and no significant departures from existing trends). In response to recommendations by the Thought Leader Panel to consider the interactive effects of the various scenarios, two bracketing scenarios, representing high and low regional demand relative to the base case, were developed using elements from the six alternative futures. The model outputs were then used to inform the evaluation of the investment portfolios under each scenario against a set of criteria, which included measures such as mode share, vehicle-kilometres travelled, health, and equity.

Portfolio Refinement

In addition to highlighting the strongest and most resilient of the shortlisted investment portfolios, the findings and observations of the resiliency evaluation were subsequently used to inform the refinement of projects, policies, and programs included in the portfolios. Identifying shortcomings and opportunities for improvement in the initial investment portfolios allowed for adjustments to be made on the types of strategies and actions included, and also the addition of strategies and actions that may contribute to more beneficial outcomes.

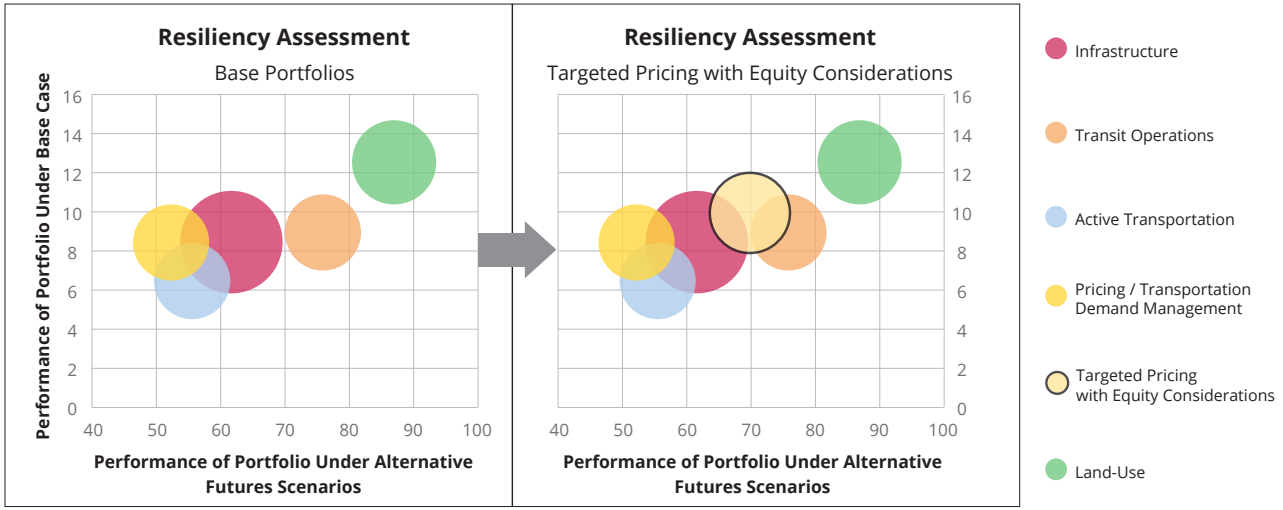
Lessons Learned

The five investment portfolios each feature a major area of emphasis: infrastructure, operations, active transportation, pricing/transportation demand management (TDM), and land use. Each portfolio builds from an established set of committed and in-progress projects to consider how complementary strategies and actions may contribute to a more resilient plan for the future. Through the resiliency evaluation, two scores were produced for each portfolio: one to describe the portfolio's performance under the expected conditions of the base case; the other to describe the portfolio's cumulative performance across the initial six alternative future scenarios. The two scores allowed for greater degrees of differentiation among the portfolios, with the best performing portfolios scoring highest in both dimensions.

While all the portfolios were found to have positive impacts across the scenarios according to the evaluation criteria, there were clear variations in performance. The land use portfolio, which emphasized planning for transit-supportive land uses, led to the best overall outcomes across the six scenarios, regardless of how the criteria were weighted. This speaks to the clear need for good land use transport integration in order for travellers to truly benefit from improvements to the transportation system.

The assessment also highlighted the need for greater emphasis on strategies that improve transit operations. The operations portfolio, which features strategies such as an expanded frequent transit network and transit priority zones, performed similarly to the infrastructure focused portfolio in the base case, but slightly better when considered across the variable conditions of the six alternative futures. Unlike fixed infrastructure, improvements to transit operations are flexible and can be adapted accordingly to changing conditions represented by the scenarios, such as changes in the level of traditional full-time employment or the emergence of autonomous vehicles. While continued investment in higher-order transit infrastructure along established corridors of travel remains of utmost importance, improved transit operations in less developed areas or areas in transition will be key to ensuring improved access for all.

In cases where the portfolios did not perform as strongly, the resiliency evaluation presented an opportunity to identify gaps and areas of improvement. For instance, the pricing/ TDM portfolio had led to desirable modelling outcomes, such as increases in transit ridership and decreases in emissions, but under-performed on measures of transport equity and access, as it would likely impose additional cost for travellers in the region. Of particular concern was the impact that these costs might have on the lowest income groups in the population. This highlighted the need for measures of equity to be more directly addressed in coordination with any pricing strategies that are implemented. An updated pricing/TDM portfolio that featured additional strategies targeting the noted equity concerns was re-evaluated and found to perform significantly better than the original pricing/TDM portfolio.



Finally, the resiliency assessment also highlighted the need to reconsider the aims of the RTP and how priorities are assessed. Although the active transportation portfolio performed more poorly than the other portfolios in the evaluation, closer examination of how it fared under specific criteria showed that the portfolio underperformed on measures that were specific to transit, such as increase in transit ridership. On measures of equity, access, and quality of life, the active transportation portfolio performed quite comparably to if not better than the other portfolios. While transit remains an important backbone to the regional transportation plan, this highlights the need to view the plan more broadly from a perspective of multi-modal mobility for the region rather than the improvement of specific modes in isolation.

Planning for Resiliency

Change is constant, and while we cannot be certain of what the future holds, we can plan for greater resilience by being aware of the range of alternative futures that may come our way and being prepared to implement robust strategies that are flexible to change and can stand the test of time.

Although different futures will necessitate different responses, it is evident from our resiliency evaluation that certain concepts remain relevant regardless of where the future takes us. The saying that "the best transportation plan is a good land use plan" continues to hold true, as integrated land uses make travel by transit, walking, and cycling easier and more convenient. Comprehensive mobility pricing, coupled with an abundance of transit and active transportation options will likely remain one of the strongest strategies in curbing excessive auto travel. Finally, a flexible and adaptable public transit system must combine investment in both infrastructure and operations to effectively meet the needs of an evolving region. Building infrastructure alone will not be able to solve the region's mobility challenges.

The alternative future scenarios developed through this work present a wide range of potential futures to consider and have been used to inform the development of the 2041 RTP in a number of different ways. In addition to highlighting potential strategies and actions that could be taken to mitigate the impacts of potential and emerging trends, the scenarios have also been used to evaluate and inform the resiliency of potential investment portfolios, which will be further distilled to form the final plan.

Through this scenario development and resiliency testing process, Metrolinx can ensure that the Next Regional Transportation Plan is one that not only meets the travel needs of people living in the region today, but will also ensure that the region continues to thrive for years to come, no matter the challenges the future brings. As the plan moves into implementation, the scenarios will continue to serve as a constant guide for adapting the plan as the future comes into clearer view.

Acknowledgments

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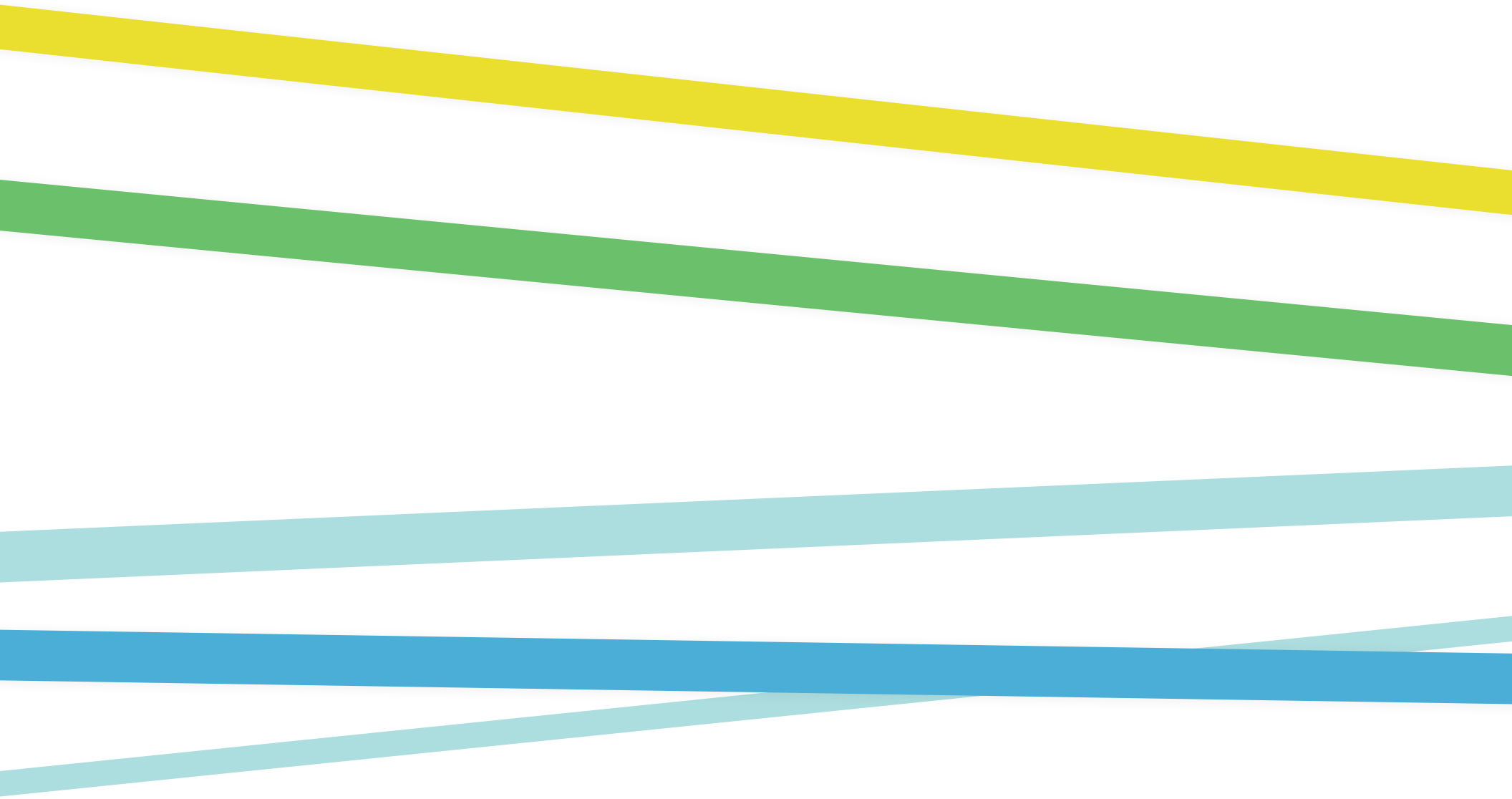
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